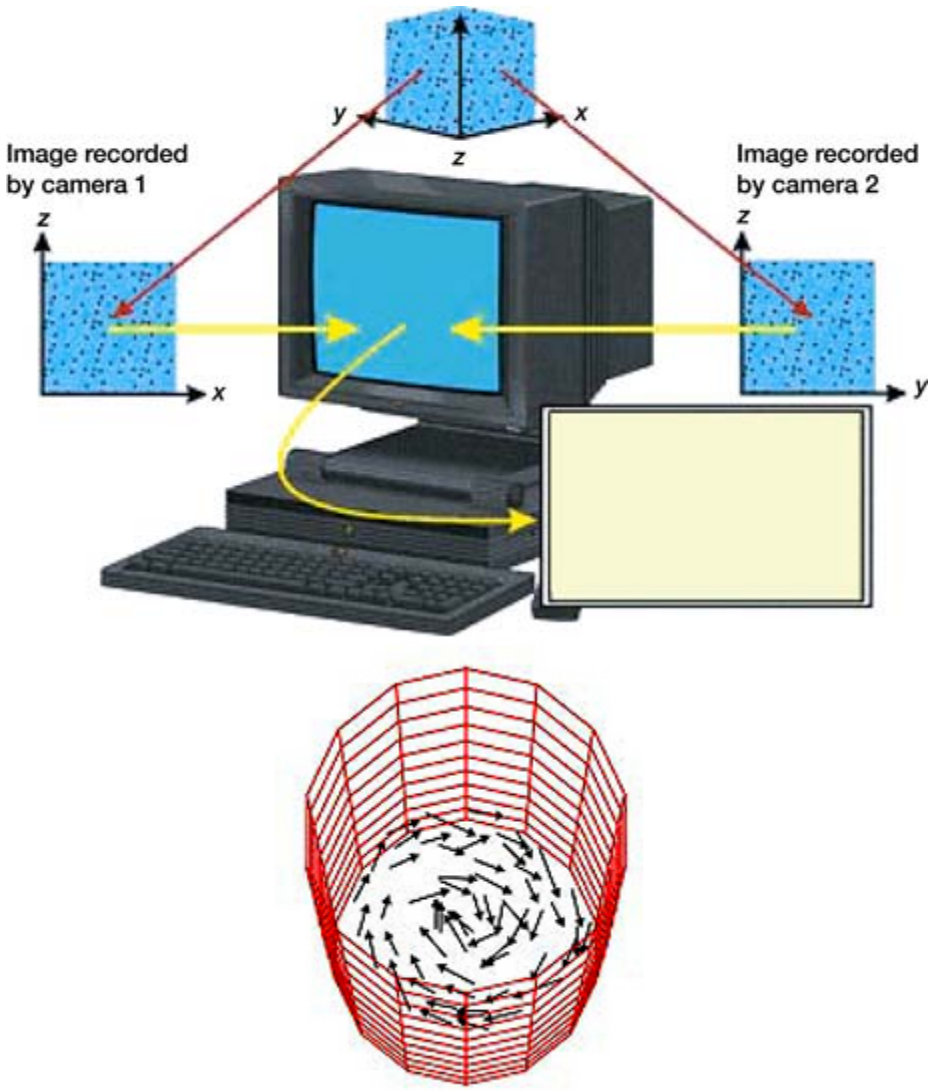
General-Purpose Stereo Imaging Velocimetry Technique Developed for Space and Industrial Applications

A new three-dimensional, full-field analysis technique has been developed for industrial and space applications. Stereo Imaging Velocimetry (SIV) will provide full-field analysis for three-dimensional flow data from any optically transparent fluid that can be seeded with tracer particles. The goal of SIV is to provide a means to measure three-dimensional fluid velocities quantitatively and qualitatively at many points. SIV is applicable to any optically transparent fluid experiment. Except for the tracer particles, this measurement technique is nonintrusive. Velocity accuracies are on the order of 95 to 99 percent of full-field. The system components of SIV include camera calibration, centroid determination, overlap decomposition, particle tracking, stereo matching, and three-dimensional velocity analysis. SIV has been used successfully for space shuttle experiments as well as for fluid flow applications for business and industry.



SIV experimental setup. Algorithms process image data to make three-dimensional, full-field, quantitative fluid flow measurements. Right: Fluid experiment seeded with tracer particles SIV vectors at Glenn (three-dimensional orthogonal view).

This technique provides a diagnostic tool for the quantitative and qualitative characterization of fluid flows. It permits direct comparisons between computed and experimentally measured three-dimensional flows. The PC-based SIV applications package is available for incorporation into existing experiments. Potential commercial uses for this technology include continuous casting, three-dimensional reconstruction, biofluid flow analysis (cell tracking), and inline process inspection.

Glenn contact: Dr. Mark McDowell, 216-433-8161, Fax: 216-433-5033, drmm@easy.grc.nasa.gov
Author: Dr. Mark McDowell
Headquarters program office: OBPR
Programs/Projects: Microgravity Science, continuous casting, three-dimensional

reconstruction, biofluid flow analysis (cell tracking), inline process inspection
Special recognition: U.S. Patents 6,603,535 and 5,905,568